REMARKS

35 USC 102 Rejections

The Examiner has rejected claims 37-38 as being anticipated by Ghislain et al. Applicant respectfully traverses these rejections and requests reconsideration.

Claim 37 of the present invention states "means for scanning said focusing optics across the DUT…". This statement clearly provides for the focusing optics being scanned. In contrast, in Ghislain, XYZ positioning scanner stage 112 as referenced by the Examiner has the DUT 20 mounted thereon. Therefore, in Ghislain it is the DUT being scanned, as distinguished from the optics being scanned in the present invention.

Applicant therefore respectfully asserts that claims 37-38 of the present invention are not anticipated by Ghislain. Applicant respectfully requests that the 35 USC 102 rejections be withdrawn.

35 USC 103 rejections

The Examiner has rejected claims 39-43 under 35 USC 103(a) as being unpatentable over Ghislain in view of Cozier. Applicant respectfully traverses these rejections and requests reconsideration.

As has been described above in the section pertaining to 3 USC 102 rejections, the present invention provides for the optical column to be scanned, in contrast to Ghislain wherein the DUT is scanned. This is a non-trivial difference, since there are some applications for which it is impractical to scan the DUT. One such case is described in the instant application, page 7, lines 14-16: "the method described in Minski [wherein the DUT is scanned – comment by Applicant] is not applicable to probe systems, since in probe systems the DUT is generally connected to a stationary test head and cannot be easily scanned".

As described in the instant application, providing a scanned optical column is also not trivial and requires special features. On page 10, lines 21-22, it is states that “minimizing the weight of the optical column to be scanned is critical…”. The present invention accomplishes this by using fiber optic cable 300 to deliver light to the objective lens, collecting light reflected by the DUT using a fiber, and restricting the light to be on-axis. This simplifies the microscope optics so that they can be made sufficiently light that the optics can be scanned at a reasonable rate using an x,y,z stage instead of scanning the DUT (see page 8, lines 11-16).

Applicant therefore asserts that the above-cited claims are patentably different from the references cited, alone or in combination. Applicant respectfully requests that the 35 USC 103 rejections of claims 39-43 be withdrawn.

The Examiner has rejected claims 1-6, 11-15, 17-23, 26-33, 35-36, and 44-47 as being unpatentable over Ghislain. Applicant respectfully traverses these rejections and requests reconsideration.

As described above, the present invention provides for the optical column to be scanned, in contrast to Ghislain wherein the DUT is scanned. This feature is necessary for applications where it is impractical to scan the DUT. And further, as described above, providing a scanned optical column is also not trivial and requires special features. In Ghislain’s drawings, the optics used to illuminate their SIL “includes a laser 38 and photodetector 42 mounted to a conventional upright microscope” (column 10, lines 58-60). The upright microscope includes eyepieces 44 for direct view of the sample 20 and for alignment of the optical elements”. Scanning such a massive structure would be difficult. The present invention simplifies microscope so that it is less massive and smaller so that scanning it becomes possible. Ghislain further discloses scanning the cantilevered

SIL tip only, across the DUT (column 13, lines 18-34. The presence of sample scanning and tip-scanning embodiments in Ghislain, and the absence of optical column scanning embodiments, clearly indicates that microscope scanning was not considered a viable alternative for Ghislain's scheme.

Regarding claims 11 and 12, there is no mention in Ghislain of a photon emission timing port or of timing emission analysis.

Regarding claims 18-23, 26-36, the SIL used in Ghislain is different in configuration and in use from the SIL described and claimed in the instant application. Ghislain clearly describes and illustrates the SIL (Fig's 1a, 3a, 3b, column 9, lines 26-27) to be "a super-hemispheric shape having a hemispheric upper surface and a pointed tip formed at the aplanatic surface". Although alternate embodiments of the SIL shape are described, it is distinctly stated (column 9, lines 38-41) that "all variations in design of the SIL probe ... have the common features of focusing light to a small spot... a probe tip that is sufficiently sharp to permit operation as an AFM probe". Ghislain's purpose in using the SIL is to provide fine resolution to resolve surface features. Ghislain states " this microscope could resolve 100 nm lines and spaces" (column 5, lines 28-29). Their tip may have a radius of curvature of about 100nm. Even in the wide-field imaging embodiment of Ghislain, the SIL tip is never described as having a radius of curvature larger than 250 microns.

In contrast, the present invention utilizes an SIL which is measuring below-surface features. The SIL is clearly shown in FIG's 6a and 6b to be of a very different shape than that of Ghislain's, i.e., with a large contact area having a large radius of curvature proximal the surface of the DUT. The claims have been amended to expressly set forth this requirement. The dimensions of the SIL surface are shown in the figure to be comparable to that of the final tip element of the objective lens, which typically has a dimension of about 5 mm. Therefore, the radius of curvature of the SIL face proximal the DUT is clearly much greater than 250 microns, the largest value disclosed in Ghislain.

All of Ghislain's drawings show their SIL tip mounted to a cantilever which is closely coupled to the sample, and distinctly separate from the rest of the optics. However, in order to implement a scanned optics scheme as in the present invention, the SIL must move together with the rest of the optics, both moving with respect to the sample.

Regarding claims 32-36, Ghislain's thin-film coating is stated to be an optical coating, for example to "scatter light with high efficiency and allow the detection of weak signals" (column 13, lines 40-41). Ghislain also states "Coating the SIL probe bottom surface with a light scattering material having a nanometer-level grain size, or attaching a small particle to the tip of the SIL probe 10 provides an improved aperture-less near-field microscope with a stronger signal level and reduced background level" (column 18, lines 45-49). The materials listed in Ghislain as possible coating materials are the metals Au, Ag, Al, and the dielectrics GaP, MgF, SF6, CaF, none of which are included in the materials cited for the coating in the instant application.

In contrast, the coating of claims 32-36 is described as a wear-resistant coating rather than the optical coating of Ghislain. The materials recited in Ghislain are too soft to function as wear-resistant coatings. The coating of the present invention serves to protect the surface of the SIL proximal the DUT. The coating of the present invention is stated to be NIR transparent so as to minimize absorption and scattering. Metallic films such as those listed by Ghislain are too soft to provide protection, and would absorb or reflect the beam too much.

In view of the above description of the differing characteristics of the present invention and Ghislain's disclosure, the Applicant asserts that the present invention is neither disclosed nor implied by Ghislain. Applicant respectfully requests that the 35 USC 103 rejections of the above claims be withdrawn.

The Examiner has rejected claim 34 as being unpatentable over Ghislain in view of Cozier. According to the above arguments regarding claims 32-36, Applicant respectfully requests that the rejection be withdrawn.

Applicant has made a diligent attempt to respond to all the Examiner's points. It is believed that the application is now in condition for allowance. An early Notice of Allowance is requested.

Respectfully submitted,

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